# FY 95 Mobile Strike Force
# Battle Command Experiment





Final Briefing Report
November 1995
TRADOC Analysis Center
Ft. Leavenworth, KS

# FY 95 Mobile Strike Force
# Battle Command Experiment

Final Briefing Report
November 1995
TRADOC Analysis Center
Ft. Leavenworth, KS

**Certified by:**

Ronald G. Magee
Acting Director
Study and Analysis Center,
TRADOC Analysis Center

**Approved by:**

Patrick Lamar
Colonel, Armor
Vice Director, Battle Command Battle Laboratory
(Leavenworth)

# MISSION

This scripted briefing serves as the final briefing report for the TRADOC Analysis Center (TRAC) analytic support to the Fiscal Year (FY) 95 Mobile Strike Force Battle Command (MSF/BC 95) Experiment.

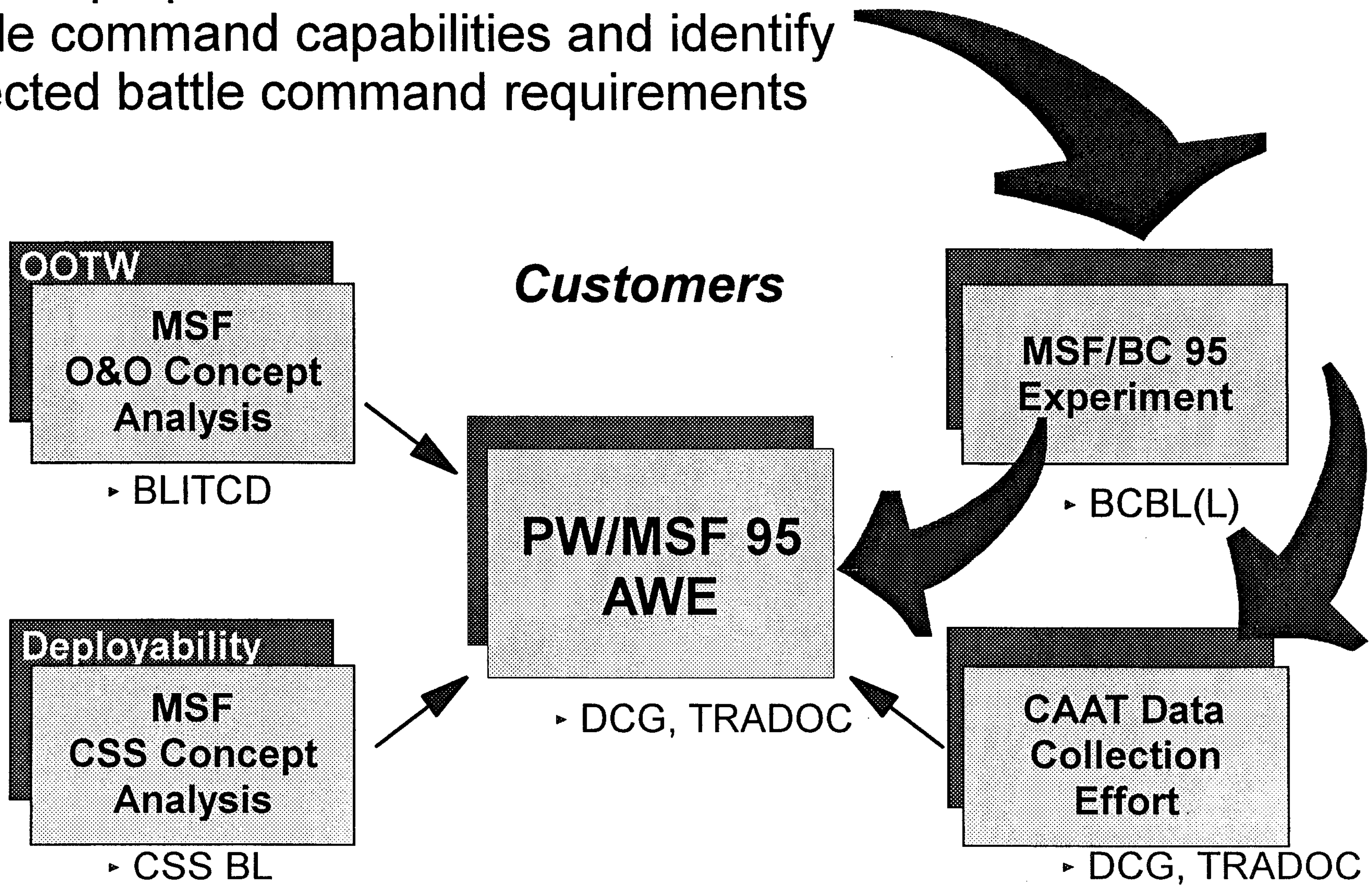
The MSF/BC 95 Experiment was one of four subordinate components of the Prairie Warrior/Mobile Strike Force 1995 Advanced Warfighting Experiment (PW/MSF 95 AWE). TRAC analysts initially worked with the Battle Command Battle Lab, Fort Leavenworth (BCBL(L)) to address the Lab's hypotheses and issues for the AWE. Hypotheses from BCBL(L) and many other agencies were then submitted to consider for examination in the AWE. Battle command issues approved by the Deputy Commanding General, TRADOC, were subsequently tasked to the TRAC MSF/BC 95 Experiment analysis team for investigation.

Results of the battle command analysis are reported in this scripted briefing and in supporting technical monographs. Highlights of the analysis were also provided to the PW/MSF 95 AWE study team and included in both the interim and final integrated AWE reports on Prairie Warrior.

# Mission

## *Dual Support to PW/MSF 95 AWE and BCBL(L)*

- Assess proposed division-level Force XXI battle command capabilities and identify selected battle command requirements



## FOCUS

The assigned battle command issues are shown here, with the relationship to the BCBL(L) hypotheses. The primary BCBL(L) issues deal with the individual and collective effects of digitization technologies on division staff organization and processes, and the potential changes in leader development requirements resulting from information operations and digitization.

The Depth and Simultaneous Attack (D&SA) Battle Lab submitted an issue on computer-assisted wargaming, which was considered as a subordinate issue under the effects of individual technologies.

The Battle Command Battle Lab, Fort Huachuca (BCBL(H)), nominated the issue concerning fully integrated C3I systems. This was also considered a subordinate issue, examined under the collective effects issue.

# Focus

## *Hypotheses and Issues*

| BCBL(L) Hypotheses | PW/MSF 95 Battle Command Issues |
|---|---|
| Digitization will change fundamental staff organization, size, location and process | What are the effects of *individual* information technologies on division staff processes and organization?<br>– Does computer-assisted wargaming enhance integration of fire support and maneuver? |
| Collaborative effects of digitization will enhance the staff process | How will digitization *collectively* affect division staff processes and organization?<br>– Do fully integrated C3I systems better achieve a relevant common picture of the battlefield than "stove-piped" systems? |
| Information operations will cause changes in requirements for leader development | What are the observed leader development requirements for information operations? |

# APPROACH

MSF/BC 95 Experiment analytic support relied on integrating multiple tools. As shown, these analytic tools included a literature review, several student surveys, and observation of student training and exercises.

Literature Review. Current command and control (C2) doctrine and organization, and leadership manuals were reviewed. The literature review also included examination of the digitized battle staff (DBS), information operations (IO), and mobile strike force (MSF) concepts to gain requisite familiarity with them. This review led to refining the survey tool to include identifying contributing leader development pillars, and to including a survey of multi-functional literacy. The results of the 1994 Battle Command AWE (BC AWE 94) were also reviewed.

Student Surveys. TRAC developed four student surveys to collect data. The study team observed during BC AWE 94 that technological literacy among the Command and General Staff Officer Course (CGSOC) battle command elective (BCE) students was not as high as generally hypothesized. The BCE is being used as a vehicle for battle command experimentation. Thus, the first survey, administered near the beginning and end of the BCE, was designed to evaluate the technological literacy of the 73 BCE students, and the BCE's effect. The survey was also administered to a control group selected at random by the Command and General Staff College (CGSC). Statistics indicated the BCE well represented the CGSOC as a whole. A survey was designed to assess multifunctionality - branch and BOS , since the DBS concept explicitly required such cross competencies. A survey was also developed to assess the importance of the nine leader competencies and difficulty of acquisition of them. It was administered near the beginning and end of the BCE to assess the effect of the experiment. Finally, a survey after the first and third simulation exercises (SIMEXes) assessed the effects of C2 technologies.

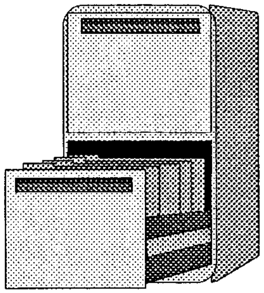
Observation of BCE 95 Activities. The study team observed all major BCE 95 activities, including classes; seminars; Phoenix (the surrogate battle command support system used in the 1995 experiment) computer training; "brown-bag lunch" tactics, techniques, and procedures (TTP) development sessions; three SIMEXes; and Prairie Warrior (the end-of-course exercise for all CGSOC students). Subsequent to the 1994 effort, the study team determined that all the student activities needed to be observed to obtain complete and accurate information regarding technology and tactical literacy, and to gain more complete knowledge of the MSF and DBS concepts to appropriately analyze and evaluate both of them.

CBS Output Data Analysis. The study team planned to analyze data from the simulation exercise-driver, Corps Battle Simulation (CBS), to measure the difference between ground truth and perception, and to assess the effects of misperception in situational awareness. This was not possible because of the limited data collected. This was due to problems extracting these data from Phoenix, because of competing demands for technical support.

IO Concept Review. The IO concept was carefully reviewed to be able to postulate the implications such a concept has for the future force. This was required as IO was not yet doctrinal, and thus, not taught as such in the CGSOC.

# Approach

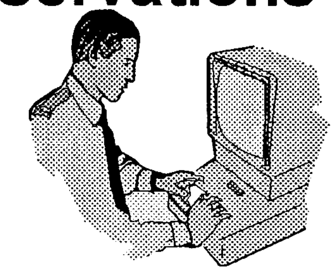
## *Multiple Tools -- Focused Methodology*



### Literature review

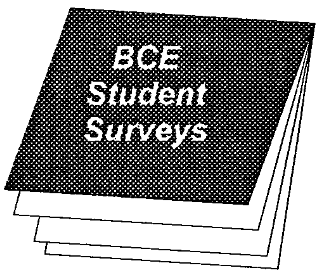
- Current staff process and organization
- Current and projected future leader competencies

### Training observations



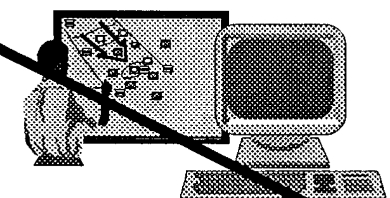
- Information technology training
- Classroom observations

### Student surveys




- Technological literacy
- Branch and BOS literacy
- Leader competencies - importance and source
- Information technology effects

### ~~Exercise driver outputs~~



- ~~Perceived versus actual situations~~

***Results too limited for meaningful analysis***

### Exercise observations


- Three simulation exercises in BCE
- Prairie Warrior

### IO concept review

- Possibilities beyond observations - study team analytic view

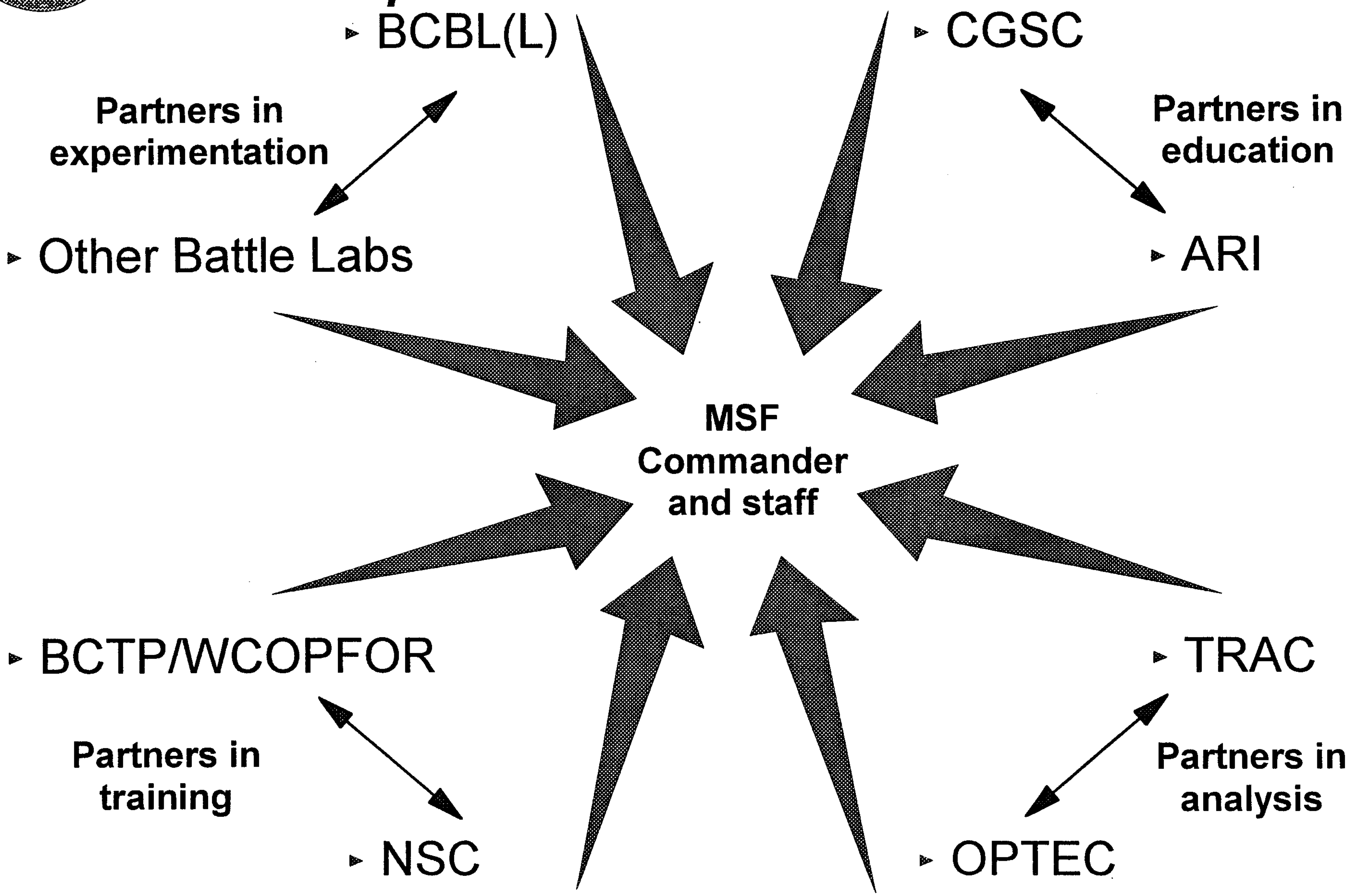
# PRINCIPAL PARTICIPANTS

As in 1994, the MSF/BC 95 Experiment involved many and varied agencies and organizations. As shown on the chart, these participants were primarily focused on different areas, based on their missions and core competencies. The areas of focus could be categorized as experimentation, education, analysis, and training. All these focused inwardly on the MSF Commander and staff, the primary vehicle for battle command experimentation. The analytic partners, OPTEC and TRAC, formed an inter-disciplinary team to conduct a credible and relevant analysis to support the BCBL(L). This team included civilians and military with various basic branch backgrounds and expertise, and with various operations research and analytic specialties. The Army Research Institute's (ARI) Fort Leavenworth field unit assisted CGSC to teach the BCE, providing a block of instruction on practical reasoning.

The training partners provided necessary simulation support throughout the experiment. However, during the culminating CGSOC Prairie Warrior exercise, training of the CGSOC was a competing objective with experimentation. This diminished the value of the information gathered during that event, relative to the analytic objectives of the experiment as a whole.

# Principal Participants

## *Partnership*



# CONTEXT

The MSF/BC 95 Experiment was as broad in perspective and varied in focus, when viewed from a doctrine, training, leaders, organization, materiel, and soldiers (DTLOMS) perspective, as when viewed previously from a participant perspective. Each DTLOMS domain was emphasized, and implied certain analytic assumptions and limitations as shown. As an example, under leader development, the presence of an active duty general officer to command the MSF greatly enhanced the experiment relative to the previous year. However, the use of the BCE numerically limited the staffing of the MSF, limited the experience level of the command and staff, and limited the time which they trained and worked together as a team.

The greatest limitation in materiel was the inadequacy of the representation of 2010 technologies - both weapons and C3I - in CBS. There was instability to the information provided by CBS relative to future weapons' and sensors' effects, which was confounding to the BCE students. This instability diminished the value of the SIMEXes for the students.

The limitations of the available equipment and capabilities were also recognized. Workarounds in CBS were required to provide representative systems' effects during the experiment. The instability of the Phoenix software and the capabilities it provided the MSF during the experiment was also disrupting. It was recognized by all experimental participants that Phoenix was developmental, but the constant revision of the software during the experiment proved exceptionally challenging to all parties in the experiment.

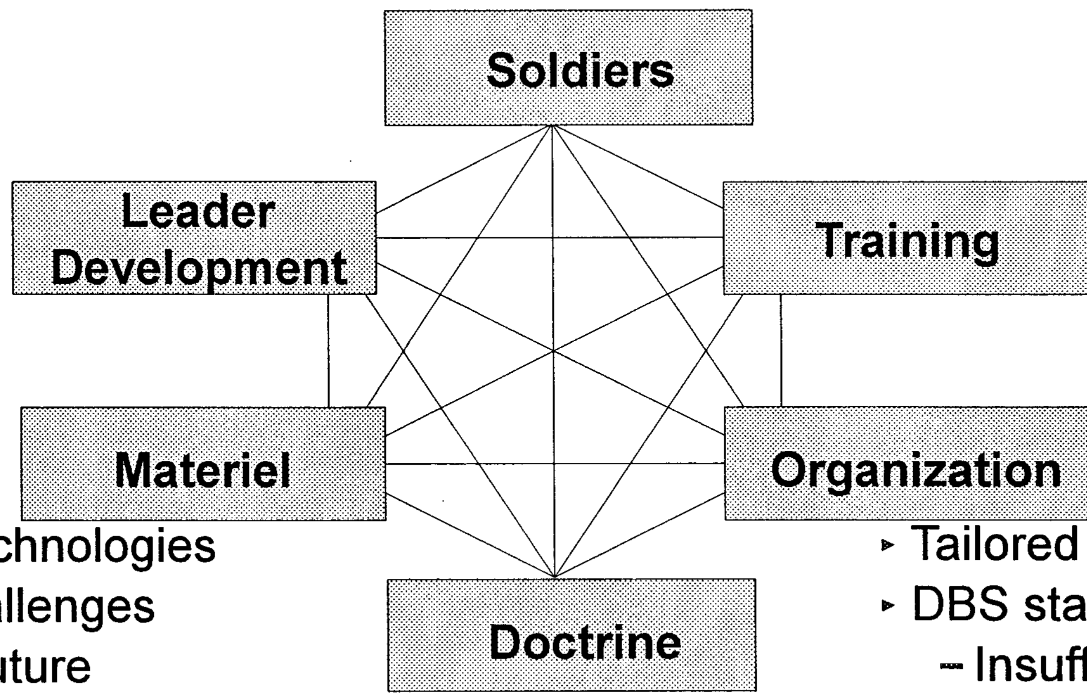
In the area of doctrine, the immaturity of the MSF, DBS, and IO concepts were all limiting factors. The introduction of multiple concepts at once was a confounding factor in the experiment as well.

The SIMEX basis for training was somewhat limiting, but probably not any more than the fact that the command and staff cells operated inside a building in a "sterile" environment, although some were in C2 vehicle mock-ups.

# Context

## *Driver for assumptions and limitations*

- Team development




- Active duty general officer commanding
- Students as key staff members and subordinate commanders

- SIMEX-based training
- Classroom
- Guest lectures
- Hands-on technologies

- 2010 combat technologies
  - Modeling challenges
- Prototypes for future information systems
  - Ongoing development
  - Networking challenges

- MSF O&O Concept
  - No initial SOP
  - No initial TTP
  - Limited DBS description of staff process and specific duties

- Tailored MSF structure
- DBS staff organization
  - Insufficient number of students to fully represent DBS

# FINDINGS

Study findings will be presented in three sections, corresponding to the study issues. The first section discusses the effects of information technologies or capabilities characterized as individual in nature. The second section presents findings on the collective technologies or capabilities. Both of the first two sections focus on effects on division staff processes and organizations. The third section will report findings concerning leader development requirements for information operations.

# Findings

***Effects of Individual Information Technologies on Division Staff Processes and Organization***

# INDIVIDUAL CAPABILITIES DEMONSTRATED

A myriad of battle command systems were again observed during the 95 experiment. As a whole, these systems represented Army battle command system (ABCS) capabilities, and included Phoenix, AFATDS, ASAS-Warrior, FAADC2I, TEM/OPS, and Log Anchor Desk (LAD). Key digitization capabilities which these systems demonstrated to some degree are listed here, using the suite of systems as a point of reference.

The foundation of a battle command system is a high quality digital map overlaid by spatially related data - a geographic information system (GIS). The essence of the battle command system is the specialized data bases which preserve locational identities of recorded information. Robust storage, manipulation, and display of these data are required to support battle command through extended battlespace in near-real-time for many functions. GIS products demonstrated included all those which were map-based, including the relevant common picture, obstacle overlay, graphic collection plan, A2C2 overlay, etc. GIS tools such as range fans, line of sight, and relief shading were shown. TEM/OPS provided the greatest clarity and detail of any available GIS and was used extensively for battlefield visualization.

The integration of ABCS components provided a look at various displays of status tools, alarms, and database management schemes. However, lack of seamless integration diminished the value of AFATDS, FAADC2I, and other systems not totally integrated with Phoenix. Several large screen display capabilities (most notably 37 and 60 inch displays) were demonstrated. Other tools supporting collaboration of the command and staff during planning and execution were available. These included the collaborative tools, such as e-mail and video- and audioteleconferencing (VTC and ATC). The whiteboard capability was another collaborative tool which was used and enthusiastically received.

Various, and surprisingly rudimentary, office automation capabilities were available on the suite of systems. These included word processing, presentation graphics, spreadsheet, and e-mail.

The experiment demonstrated that robust GIS capabilities and a suite of collaborative technologies are essential components of the battle command system to support the knowledge-based force.

# Individual Capabilities

***Most capabilities demonstrated in Phoenix, ASAS, AFATDS, TEM-OPS, FAADC2I, or LAD***

- Digital map
- Graphical display of friendly and enemy unit location and strength
- Graphical overlays of plans and orders
- Other status tools and displays
- Video teleconferencing
- White board
- Telephone
- Radio
- Audio teleconferencing

- Large screen display
- Voice recognition software
- Range displays
- Line of sight and other terrain analysis tools
- Alarms
- Data base management system
- Electronic mail (text, graphics)
- Word processing
- Presentation graphics
- Electronic spreadsheet

✓ ***Robust geographic information systems and collaborative technologies essential for the knowledge-based force***

# INDIVIDUAL CAPABILITIES CONSIDERED

There were several key digitization requirements which were considered through the experiment, but were demonstrated to only a very rudimentary degree or not at all. Those requirements are listed on this chart.

The actions and statements of both the MSF commander and his staff indicated a need for the dynamic update and display of enemy and friendly forces. Situational awareness, enhanced over current fielded capabilities, was provided to the commander by the systems. However, there was a problem with the timeliness of information - the system would be further enhanced if information were tagged with a "freshness" indicator. As a surrogate for dynamic unit movement the MSF staff, using the playback feature on Phoenix, developed a technique to display enemy movement over time. This helped the intelligence staff to perform some predictive analyses. However, these demonstrations fell well short of objective requirements.

A course of action analysis tool was again shown to be needed in this environment. There was not a resident, embedded capability provided by Phoenix, although this had been an objective of the BCBL(L). Such a capability would necessarily integrate a suite of tools including ones to perform force tailoring, or task organization, wargaming, and development of associated battle command templates and matrices. The planning and execution tools must assist the staff to generate diverse products such as the synchronization matrix and decision support template to be useful.

# Individual Capabilities

## *Capabilities considered on Phoenix, ASAS, AFATDS, TEM-OPS, FAADC2I, or LAD*

- Dynamic update and predictive analysis tools
- Course of action analysis tools
  - Force tailoring
  - Wargaming
- Planning and execution tools (synchronization matrix, decision support template)

**✓ *COA, planning, and predictive analysis tools conspicuous in their absence***

# PRINCIPAL MEASURES OF INDIVIDUAL EFFECTS

To assess the effects of the information technologies or capabilities characterized as individual in nature the focus was on students' perceptions and analysts' observations. The information derived from these sources was used to identify and substantiate battle command digitization requirements.

A survey of the BCE was conducted after the first and third SIMEXes to assess the effects of the individual technologies. This survey asked for an assessment of the effect of situational awareness tools (integrated in Phoenix and ASAS) on the quality, speed, and timeliness of situation assessment. The assessment was made on a five point scale, ranging from very poor, slow or untimely to very high, fast, or timely for the respective categories. An assessment was also made of the effects of real-time collaboration tools on situation assessment. As shown, these tools were categorized as voice, visual, or written. This assessment scale ranged from very negative to very positive for all categories. Voice includes such means as radio, telephone and audioteleconferencing. Visual means include face-to-face and videoteleconferencing. Written real-time collaboration tools include text and graphics of various types transmitted via e-mail.

# Principal Measures of Individual Effects

## *Focus on Student Perceptions, Analyst Observations*

***Situation Assessment***

- Quality
- Speed
- Timeliness

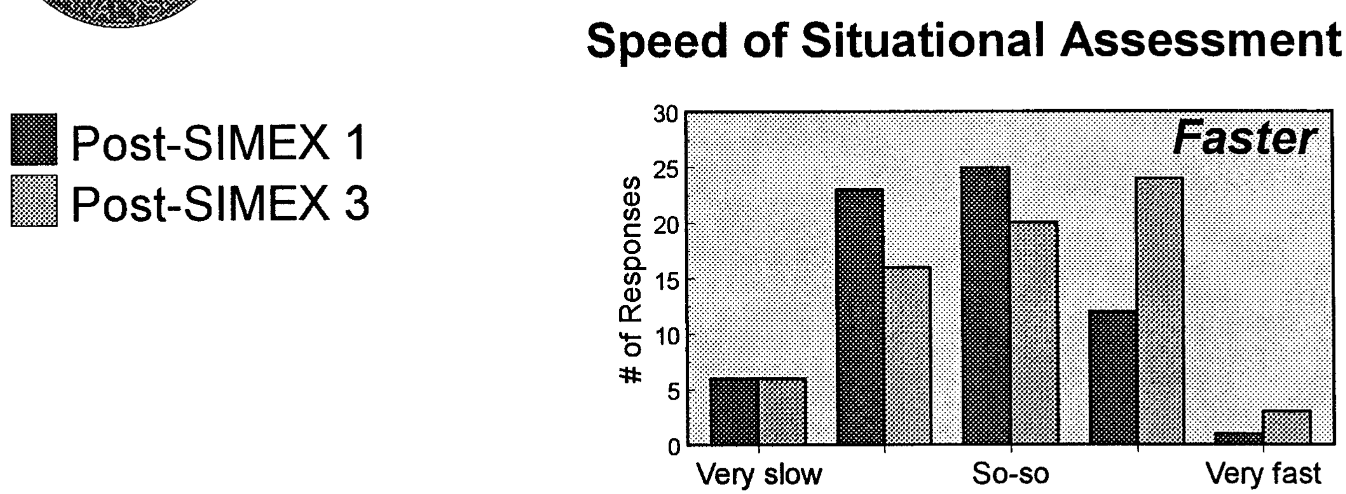
- Situational awareness tools
  - Phoenix
    ASAS
- Real-time collaboration tools
  - Voice
  - Visual
  - Written

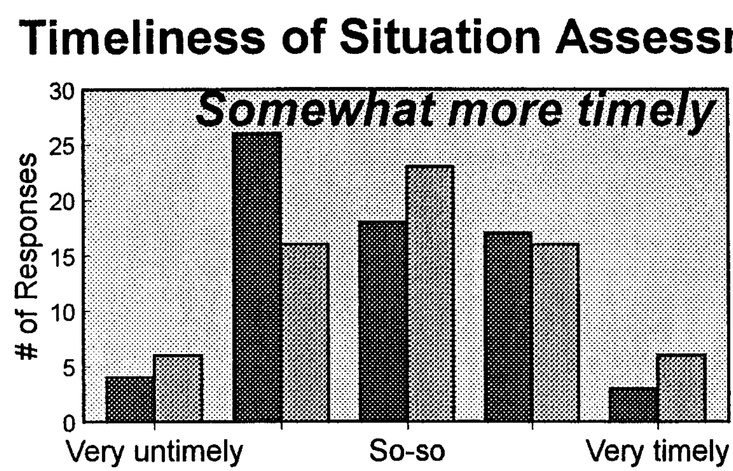
## EFFECTS OF SITUATIONAL AWARENESS TOOLS

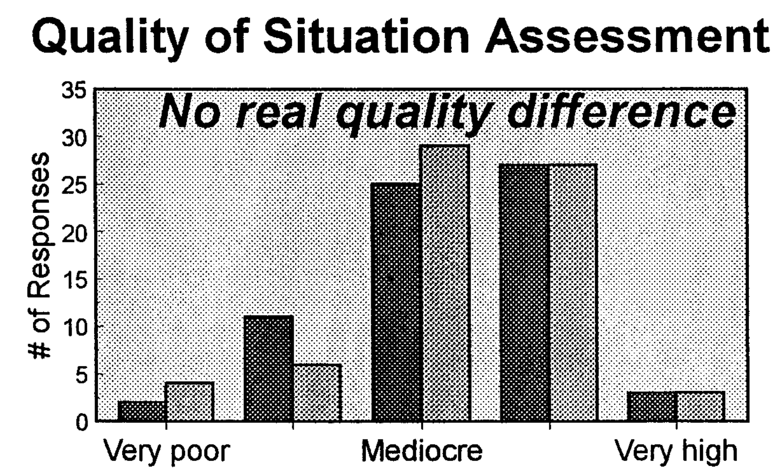
This chart shows the results of the two surveys for the three categories of speed, timeliness, and quality. As stated prior, these are the effects of the suite of tools as integrated in Phoenix and ASAS. As shown on the graphs, there was an assessed discernible, but modest, improvement in both speed and timeliness of situation assessment. However, there was no clear change in quality. Overall, the BCE indicated that objective ABCS requirements were not met by Phoenix or ASAS as they were used in the 95 experimentation to support situation assessment.

# Effects of Situational Awareness Tools

## *On Situation Assessment*




✓ ***Objective requirements not yet met***

✓ ***Modest improvement in timeliness and speed***

# OBSERVATIONS

Key digitization capabilities are shown on this chart. The need for and usefulness of high quality graphics in a battle command support system was evidenced throughout the experiment. First and foremost, the maps which looked like familiar military maps were more useful to the BCE students. Tools which added value to this base, graphic overlays, range fans, and situational awareness enhancements, were extremely useful, and effective in supporting planning and execution. The ABCS concept was shown to be critical in that seamless connectivity and interoperability among battle command systems facilitated command and staff functions in the experiment. However, the lack of complete seamless integration diminished the value of AFATDS, FAADC2I, and other systems not totally integrated with Phoenix. The integration of ABCS components was required to develop requisite situational awareness. However, the staleness of information adversely affected the staff throughout the experiment. The uncertainty as to how fresh near-real-time information was diminished the effectiveness of the MSF staff on several occasions. An integrated course of action analysis or wargaming tool would have provided a predictive component to the command and staff to mitigate this problem. This capability was promised, but could not be incorporated into the system during the experiment.

Large screen displays and selective digitization, as opposed to the elimination of all manual processes, were shown to be essential to battle command success. Command and staff must have a display showing the entire extended battlespace, with map scale and resolution to support tactical decisionmaking. Voice recognition software showed some promise to facilitate staff work. Ease of systems' use can probably be enhanced by this means in the objective battle command system. The experiments repeatedly showed that the objective system must be user-friendly. A suite of collaborative tools were seen to be especially effective. These included the VTC and ATC, the white board, an electronic marker pen, and a robust audio linkage among Phoenix systems.

Observations revealed some inflexibilities with the experimental system. The lack of redundancies and graceful degradation adversely impacted the command and staff on many occasions. More flexible battlefield control measures would have enhanced staff performance - they began developing several during the experiment.

A major observation was that the idea of a "paperless TOC" needs to be dismissed. Although the MSF attempted to conduct training without the use of paper maps, many processes were seen to be done more quickly on paper. Further, speculation that future staffs will not gather around large map displays for planning and discussions was contrary to MSF operations. They indicated it is difficult to get a good sense of the battlefield and the spatial relationships among units and features on a small screen, particularly in the extended MSF battlespace. The experiments showed alternative staff organizations and processes are possible to exploit digitization and provide virtual collocation.

# Observations

## *Digitization Requirements*

- High quality graphics
  - Map ... friendly and enemy situation ... range fans ... graphic reports ... grid overlay
- Compatibility with suite of tools
  - ABCS concept critical
- Large displays essential
  - Spatial relationships ... battlefield visualization ... group interactions
- Voice recognition
  - Facilitate ease of use ... C2 on the move
- Other useful collaborative tools
  - VTC ... white board ... light pen

## *Digitization Concerns*

- Flexibility
  - Redundancies ... graceful degradation
  - Battlefield control measures
  - Paper required
- Freshness of information uncertain
- Reported delays up to six hours in PW
- Robust dynamic display needed

✓ ***"Near-real-time" situational awareness can be misleading - must include accurate predictive component***

# FINDINGS

This section presents findings on the collective effects of information technologies or capabilities on division staff processes and organizations. As will be shown, these are effects of the suite of battle command technologies and the knowledge-based environment created during the experimentation.

# Findings

***Collective Effects of Information Technologies on Division Staff Processes and Organization***

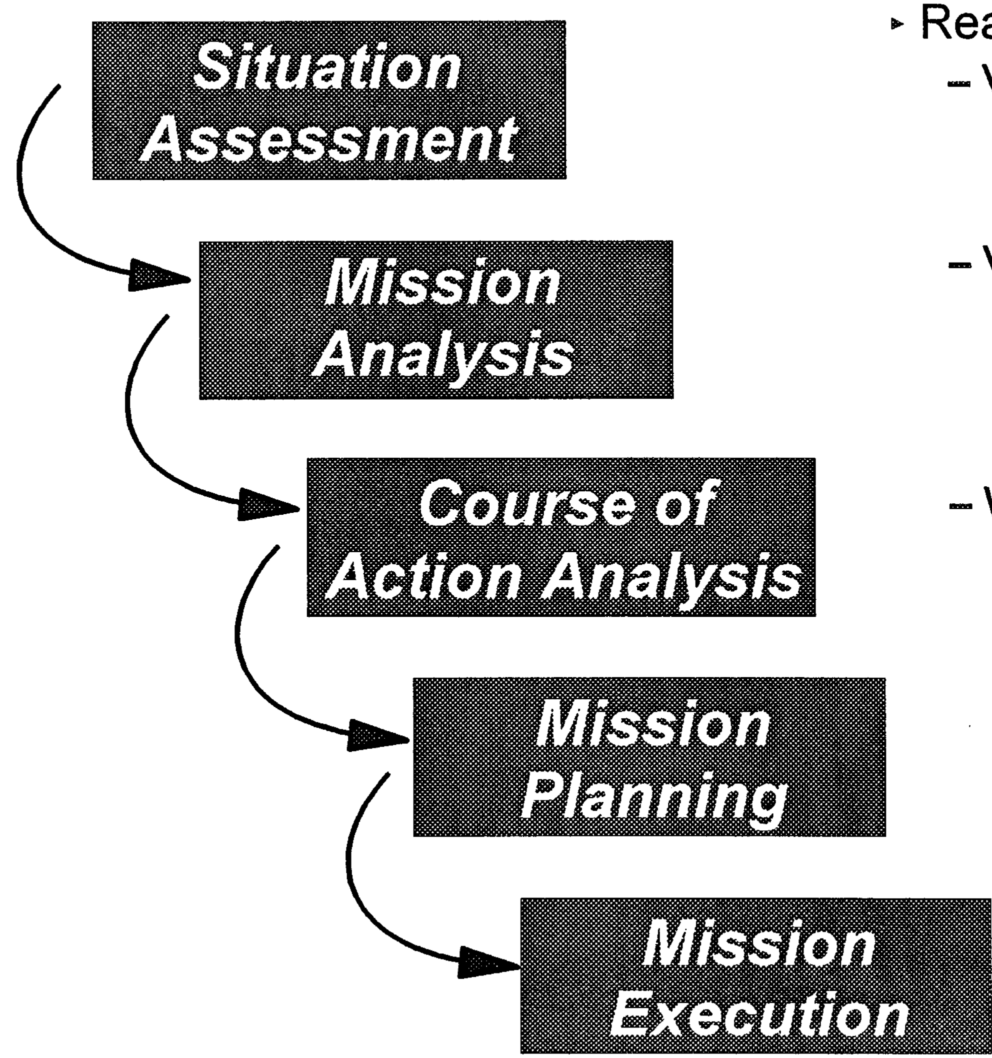
# COLLECTIVE CAPABILITIES

Collective capabilites is the term which characterizes the entire suite of battle command systems or the knowledge-based environment created during the experiment. The focus of the analysis of the collective capabilities was on the effect of the suite of real-time collaboration tools on mission analysis, course of action analysis, mission planning, and mission execution. This briefing will describe the salient results related to mission planning and execution. The effects of the suite were most significant on these two functions.

These tools were categorized as visual, voice, or written. Included among various visual battle command tools were the VTC and the white board. Voice tools included telephone, radio, and ATC. The written real-time collaboration tool was e-mail, which was used to distribute both text and graphics.

# Collective Capabilities

## *Effects of Improved Situation Assessment on Mission Planning and Execution*




- Real-time collaboration tools
  - Visual
    - Video teleconferencing (VTC)
    - White board
  - Voice
    - Telephone
    - Radio
    - Audio teleconferencing (ATC)
  - Written
    - Electronic mail (text, graphics)

**Analysis Focus**

# PRINCIPAL MEASURES OF COLLECTIVE EFFECTS

The survey conducted after the first and third simulation exercises (SIMEXes) also assessed the effects of the collective technologies. To assess the effects of the information technologies or capabilities characterized as collective in nature the focus was again on students' perceptions and analysts' observations. The information derived from these sources was also used to identify and validate battle command digitization requirements.

The survey asked for an assessment of the effects of the suite of real-time collaboration tools on mission analysis, course of action analysis, mission planning, and mission execution. The salient results of the survey regarding the effects of the suite on mission planning and execution will be discussed. These were the two functions in which all students fully engaged. The assessment was made on a five point scale, ranging from very negative to very positive in all categories. An assessment was also made of the effects of real-time collaboration tools on each of the seven BOSs.

Observations of the three SIMEXes and Prairie Warrior were also again used to corroborate or refute the results of the student survey. Analytic methodology required that observations be used to corroborate or refute all survey results throughout the AWE.

# Principal Measures of Collective Effects

## *Focus on Student Surveys, Analyst Observations*

- Ratings of effects (very negative to very positive) on mission planning and execution subsequent to SIMEX 1 and SIMEX 3
- Observations of mission planning and mission execution during SIMEXes and Prairie Warrior -- focus on quality and effectiveness assessments by observers

# EFFECTS OF REAL-TIME COLLABORATION TOOLS

The chart shows the results of the two surveys relative to the effect of the tools on mission planning. The graph shows the number of respondents who assessed the effects of the suite of tools on mission planning from very negative to very positive.

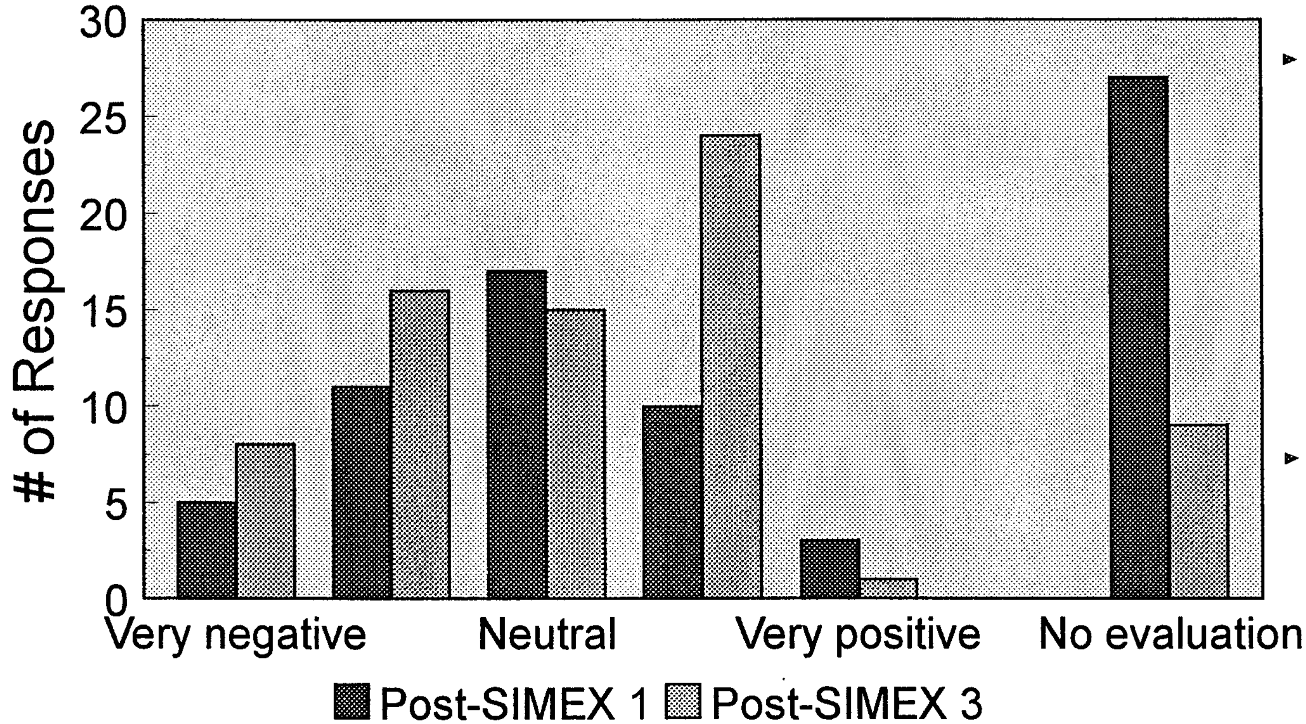
The students' responses indicated some ambivalence regarding the effect of these tools on mission planning. A fairly large number of the class shifted from not making an evaluation after the first SIMEX, but seemed split when doing so. As can be seen, positive responses more than doubled in the second survey, but very negative and negative responses also increased.

There were several factors which could explain this result. First, the e-mail capability provided to the students was very cumbersome to use. Most students were familiar with the more user-friendly e-mail systems typically associated with current office environments. Second, the VTC capability was limited severely by its bandwidth requirements. This caused its usage to be constrained and it to be limiting to the suite of systems as a whole. Third, offsetting these limitations were the very positive effects of the white board and ATC capabilities. In combination, these two tools were very effective aids for planning, rehearsal, and execution. Finally, the ambivalence may be explained by the frustration of some of the BCE students by the lack of automated planning tools. The lack of such tools was probably more frustrating because the capability was announced to students, but was not available during the experiment.

Mission planning was very conspicuously weighted on initial planning activities. Once into execution, there was little and probably inadequate integration of sequels and branches developed by the second plans and operations (P & O) team. Information overload was a contributing factor to this, as the large volumes of data being processed caused reactive decisionmaking. The MSF Commander attempted to stay above this to see the big picture, but even he became inundated with data as the division became involved in a close battle. This situation, which was unabated during the experiment, was more evidence of the need for filters to continually produce the relevant common picture for the commander. This situation also reinforced the requirement for very robust plans, including multiple, logical, and easily integrated branches and sequels. The information systems can be designed to support this requirement for robust planning.

# Effects of Real-TIme Collaboration Tools

## *On Mission Planning*




- Students divided on effectiveness of real-time collaboration tools for mission planning
  - E-mail cumbersome
  - VTC limited
- May also reflect frustration at lack of automated planning tools

- Detailed initial plans but little integration of sequels and branches from separate P&O team
- Receipt of large amounts of data resulted in reactive decisionmaking

✓ ***Broader and more widely disseminated knowledge base will enable leaders to build more robust plans***

## EFFECTS OF REAL-TIME COLLABORATION TOOLS

This chart shows the survey results relative to the effect of the tools on mission execution. In this case, the graph shows the number of respondents who assessed the effects of the suite of tools on mission execution, ranging from very negative to very positive.

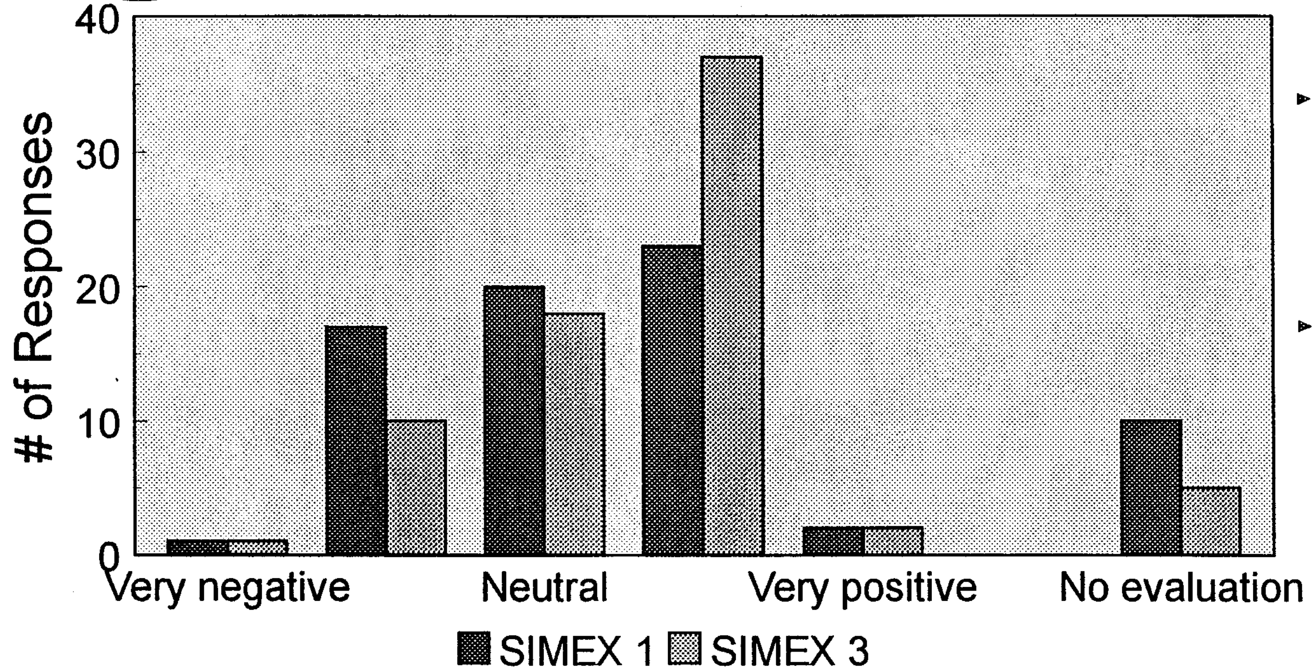
The students' responses indicated a shift to the positive regarding the effect of these tools on execution. As can be seen, positive responses increased, while negative responses decreased. This was probably due in large part to the better dissemination of friendly and enemy situational overlays during the experiment. Although the e-mail capability was cumbersome to use, the students became more familiar with it over time, which also aided the staff during mission execution. The white board and ATC capabilities were also used more and more as the experiment progressed, becoming an integral and essential part of command and staff operating procedures.

Diminishing the positive effects of the suite of tools on execution was the lack of timeliness of some key data and information, usually in the targeting realm. Although timeliness has been previously shown to have improved, the improvement was small and the delays in targeting data were memorable enough to overshadow the improvements.

Near-real-time situational awareness capabilities were better than what standard current systems provide, but did not yet provide location data accurate and timely enough to use to target directly.

# Effects of Real-Time Collaboration Tools

## *On Mission Execution*




- Clearly a more positive shift from students' perspective
- Likely due to better dissemination of friendly and enemy situational overlays

- DIVARTY staff often two hours behind determined enemy location intelligence - location estimates sometimes used to process fire missions

✓ ***Near real-time situational awareness, while reportedly better than current state, did not provide targeting quality information in these exercises***

# EFFECTS ON STAFF ORGANIZATION

The Digitized Battle Staff concept could not be fully evaluated. The DBS was designed to overcome the functional "stovepipes" which tend to exist in the current staff organization and to flatten the organization to optimize the use of information in battle command. During the experiment there was neither complete staffing nor adequate training of the staff. Furthermore, the training focus was split between the several concepts which were examined in the experiment. The concept needs to be re-looked, with some modifications and with further incorporation of the positive aspects of the traditional G-staff.

There were several aspects of the concept which were promising. First was that of the idea of plans and operations teams working plans from the mission planning through execution stages. The idea of one team executing the plan which they developed has great merit, but needs good cohesion of the staff to successfully execute the handoff of operations when transitioning from one plan to the next. In other words, the handoff is still an issue, but under DBS a team owns the plan until the "end" of an operation, rather than until sometime in the middle. However, it may be difficult to recognize that "end". Second, the DBS demonstrated the potential for flattening the organization and for flexibly virtually collocating staff for collaboration.

A significant finding of the experiment was that the requirement for multi-functional staff officers may be lower than anticipated, and hence, more manageable in the future. That is, staff may only be required to have competency across several closely related branches. Because asymmetrical, or unbalanced, mixed force packaging, was emphasized in the MSF, this requirement is likely to be valid in the future force. The DBS concept explicitly stated a multi-functional requirement, but only implied the potential degree of requisite cross competency. The assessed level of student branch and BOS cross competency will be discussed later.

The idea of a "paperless TOC" was intertwined the DBS experimentation. As stated previously, this idea needs to be dismissed. Although the MSF Commander attempted to conduct training without the use of paper maps or any printed products from Phoenix, many processes were seen to be done more quickly on paper and paper provided a backup to the electronic system. This backup proved essential during the experiment, as there were multiple catastrophic system failures which challenged the BCE during planning in two of the SIMEXes.

Again, the experimental conditions were such that the DBS concept could not be adequately evaluated. This was especially true regarding the degree to which any problems with "stovepipes" were mitigated by the concept. However, because there were some observed promising aspects to the concept, it needs to be evaluated further.

# Effects on Staff Organization

## *Digitized Battle Staff*

### Experiment Limitations

- Immature concept description
- MSF incompletely staffed
- Training focus split

| | Current Heavy Division HQ TAC/ Main/Rear | DBS Concept |
|---|---|---|
| **Personnel** | 437 | 220 |
| **Wheeled Vehicles** | 89 | 81 |
| **Tracked Vehicles** | 7 | 12 |
| **Helicopters** | 0 | 3 |
| Plus Reserve Components Augmentation | Signal not included | Includes Signal Support |

### Promising Aspects of Concept

- Alternative "cradle-to-grave" planning and execution methods
- Potential for virtual collocation, flattening of organization
- Effects of integrative capability

### Multi-functionality Requirement

- Relook DBS - may be lower than anticipated
- BUT -- asymmetrical force packaging heightens requirement

✓ ***Context for evaluation inadequate***
✓ ***Further experimentation needed***

# POTENTIAL EFFECTS ON DOCTRINE/PROCESS

Collectively the information technologies were enablers of information operations (IO). The MSF Commander used IO as an interlocking component of doctrine to link the MSF and DBS concepts as well as the four doctrinal pillars shown. Because the Army leadership committed to dedicate the services of an active duty general as the commander of the MSF, there was an unexpected furthering of doctrine during the experiment.

IO is basically information warfare applied at the operational and tactical levels. For MSF operations, IO was primarily the execution of command and control warfare (C2W). C2W rests upon and integrates the pillars of physical destruction, intelligence, electronic warfare (EW), deception, psychological operations (PSYOP), and both operations and information security (OPSEC and INFOSEC). The integration of these pillars to achieve maximum exploitation of information is based upon situational awareness. Through complete understanding of location, status, and intent of both the enemy and friendly forces, the force commander can maximize mission success while minimizing risks. Because IO was still a concept and not doctrine taught in the course of CGSOC, the MSF Commander slowly developed IO application in the MSF over the duration of the BCE. The MSF Commander began integration of IO into MSF operations by building a base of situational awareness enabled by development of the force level data base. This force level data base, the common picture, was the key to all MSF operations.

The MSF Commander focused all his planning on the successful culmination of mission execution resulting in one target - one bullet decisive combat operations. To achieve such an efficiency of operations with the MSF, he established several tenets of planning. First, he emphasized asymmetric, or unbalanced, packaging of tailored organizations to execute all missions. Second, he emphasized the layering of capabilities and the nesting of plans. Third, he relied on the establishment of signature events and triggers to synchronize all MSF operations against the division target.

The major observation in the maneuver pillar was that the MSF fought over a greatly extended battlespace. To successfully dominate this extended battlespace, the MSF Commander sought to deny unimpeded maneuver to the enemy in designated areas. He, thus, economized his force while accomplishing assigned missions. In the precision fires pillar the integration of fires requirement was evident. The use of flexible engagement areas facilitated the engagement of the division target as it moved into and throughout the MSF battlespace. This was supported by the focused tracking of the target, supported by the precision reconnaissance pillar, as executed with the decide, detect, track, deliver, and assess (D2TDA) methodology. In the maneuver logistics pillar, the efficient and effective use of assets was emphasized. The concept of predictive logistics was the primary enabler of logistics efficiency.

# Potential Effects on Doctrine/Processes

## *IO advances enabled by information technologies*

**Information Operations**

- One target -- one bullet concept
- Asymmetric packaging
- Layering and nesting
- Signature events and triggers

**Maneuver**

- Extension of battlespace
- Domination of battlespace

**Precision Fires**

- Integration of fires
- Flexible engagement areas

**Precision Recon**

- Force orientation - precise division target
- D2TDA methodology

**Maneuver Logistics**

- Predictive logistics
- Efficient use of assets

***✓ Four doctrinal pillars interlocked by IO concept***
***✓ Doctrinal advances heightened by investment in MSF CDR***

# FINDINGS

This section discusses the findings concerning leader development requirements for information operations. Although IO was not doctrinal at the time of the 95 experiment, by understanding the concept, implications for Force XXI could be postulated. These implications are discussed in terms of leader competencies, and technological and multi-functional literacy.

# Findings

***Leader Development Requirements for Information Operations***

## LEADER DEVELOPMENT ISSUES

The literature review revealed nine leader competencies identified by FM 22-100, *Military Leadership*. These competencies are shown on the chart. The study team determined that examination of these competencies over the experiment would be useful for understanding the impacts of information operations on leader development. Linkages to this set of leader competencies were traced both in prior and future concepts; the set appeared robust and no adjustment was made to it for this analysis.

To examine potential IO impacts on leader development further, both technological and multi-functional literacies of the students were analyzed. The contribution of each of the three leader development pillars, as perceived by the students, was assessed relative to leader competencies, and technological and multi-functional literacy.

# Leader Development Issues

## *Impacts of Information Operations*

- Perceived changes in the importance and difficulty of acquiring leader development competencies

- Potential shifts required in the pillars of leader development - institutional, operational assignment, and self development activities

- Other potential leader requirements arising from information operations (e.g., technological or multi-functional literacy development)

**Leader Competencies (FM 22-100)**

- Decisionmaking
- Technical and tactical proficiency
- Professional ethics
- Communications
- Soldier team development
- Planning
- Teaching and counseling
- Use of available systems
- Supervision

✓ ***Assumed no changes in basic set of competencies; literature search confirmed this set as enduring, flexible***

# PRINCIPAL MEASURES FOR LEADER DEVELOPMENT ANALYSIS

A survey was conducted during the battle command experiment to assess any changes in the perceived importance of the nine leader competencies and the difficulty of acquiring them. This survey was administered to the BCE and a CGSOC control group near the beginning and end of the BCE.

A survey was also administered to the BCE and a CGSOC control group near the beginning of the BCE to assess students' perceived technological literacy. This survey was re-administered to the BCE students subsequent to the third SIMEX to assess the effects of the BCE on technological literacy.

A survey was also administered to the BCE to assess their perceived multi-functional literacy, that is, cross competency in branches and BOSs.

Each of these surveys required that the students indicate which of the three leader development pillars - institutional, operational assignments, and self-development - contributed to their self-assessed level of competency or literacy. Further, the surveys required that the students indicate the relative value of any contributing pillars.

# Principal Measures for Leader Development Analysis

***Taken from BCE "before and after" surveys, CGSOC control group surveys, and end-of-term interviews***

- Student rankings of leader competencies' importance
- Student rankings of leader competencies' acquisition difficulty
- Student self-assessments their technological and Branch/BOS literacy
- Student ratings of contributions of institutional, operational assignments, and self development pillars

## CHANGES IN LEADER COMPETENCIES

The results regarding the leader competencies of decisionmaking and professional ethics will be discussed in this scripted briefing. These two were selected for discussion because of their significance. Complete results of the surveys are discussed in the supporting technical monograph, which will be described subsequently.

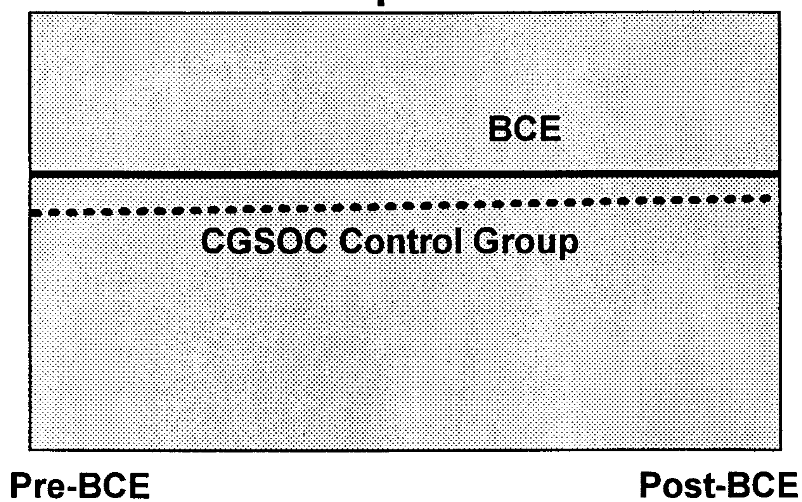
As shown by the graph on the left, the surveys indicated that neither the BCE nor control group changed their opinions about the relatively high importance of decisionmaking. However, while the control group also did not waiver in their assessments of the difficulty of acquiring the skill, the BCE students indicated acquiring competency in decisionmaking will be more difficult for officers of the future than they initially thought. The factor of information overload, or "too much data," was frequently cited by the students as an element that can complicate decisionmaking. This information, increased in volume and perhaps complexity, may be compacted into a much shorter arrival and processing timeframe, possibly without adequate or proper filtering. The commander may have problems determining what is important and what is not. Commanders could also delay the operation to wait on that last piece of "required" information before making decisions. Data may also be compartmentalized due to the nature of individual computer workstations, creating a situation where staff efforts are fragmented and disjointed. Future digitization must allow staffs to pull all relevant elements of information together into one relevant common picture. Finally, the environment in which the BCE students practiced decisionmaking skills was a simulation-driven exercise, where the students had to make time-sensitive decisions with measurable consequences in terms of battle outcome. This environment, as opposed to a classroom lecture or practical exercise, may be much more effective in heightening awareness of the difficulty of decisionmaking.

There are two significant implications for Force XXI. First, the proliferation of information technology can lead to information overload. This overload can certainly increase the difficulty of decisionmaking. Second, although many of the new systems and technologies may present some difficulties with usage and especially integration, experience with the technologies was shown to mitigate these difficulties. Thus, the training opportunity provided to the BCE was more realistic in terms of future force expectations.

# Changes in Leader Competencies

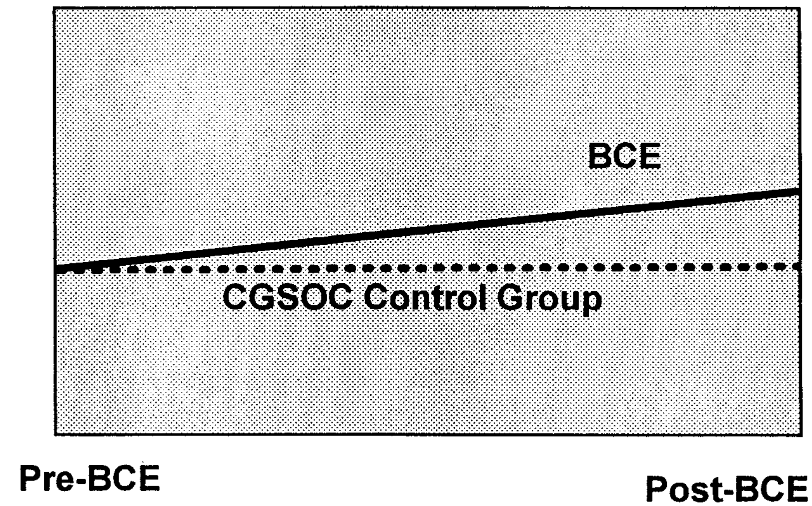
## *Decisionmaking*

Importance




- Relatively high importance

Difficulty to Acquire




- Increased awareness of difficulty of decisionmaking by BCE students

✓ *Information overload*
✓ *More realistic training for BCE*

## CHANGES IN LEADER COMPETENCIES

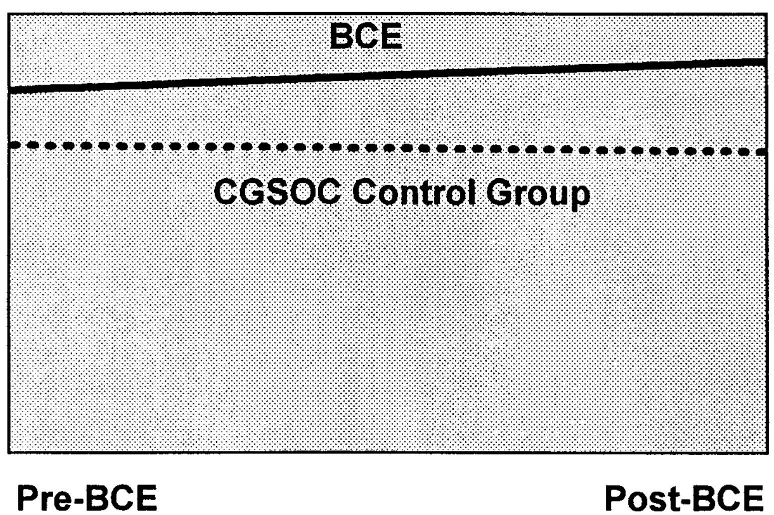
Both the BCE and the control group ranked professional ethics very high in importance. Both groups also moved from an initial belief that acquiring professional ethics was less difficult than other competencies, to a recognition of potential difficulties. The BCE students moved sharply up the difficulty scale and offered several explanations for this result during post-survey interviews. Digitization will increase individuals' access to data, and potentially more knowledge, which will bring a corresponding increase in the requisite responsibility to apply that additional knowledge according to accepted ethical standards. Increased data availability also provides greater opportunities or temptations for the unethical exploitation of such data. The computer will make it easier to communicate incorrect information and blame it on automation.

There are many factors which may contribute to the difficulty to acquire professional ethics. Societal changes, characterized by eroding family values, makes it imperative that the Army continue to emphasize the acquisition and exercise of high professional ethics.

# Changes in Leader Competencies

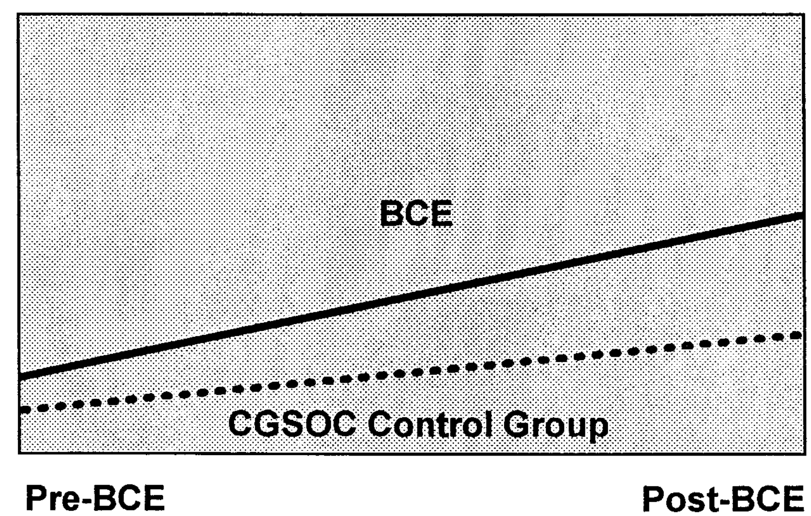
## *Professional Ethics*

**Importance**




- High in importance for both groups

**Difficulty to Acquire**




- BCE students see a sharp rise in difficulty for future leaders

***✓ Erosion in family values***
***✓ More info ⇒ more responsibility***

# TECHNOLOGICAL LITERACY

During the 1994 experiments technological literacy was determined to be a shortcoming and required further examination. A survey administered in the 95 experiment showed that, among the technologies, the students assessed their competency as lowest in those which are the fundamental technologies for the command and staff of a knowledge-based force, such as Force XXI. These fundamental technologies are automated planning tools, GIS, and VTC. These provide the digital map with associated databases, automated decisionmaking support, and virtual collocation capability. On the other hand, office automation applications, including word processing and graphics, were the highest ranked competencies. This is an indication of those technologies with which Army officers have had experience.

The BCE experience had two significant effects related to technological literacy, as indicated by the second survey. The first effect was to appear to raise the level of competency for all technologies. The CGSOC as a whole may have had some effect on the students as well, particularly concerning office automation technologies. However, the second effect of the BCE was to raise competency by the greatest degree in those technologies described as fundamental for the knowledge-based force. This rise probably cannot be attributed in any way to the course in general. The indication of this rise in competency shows the value of training and experience to develop technological competency.

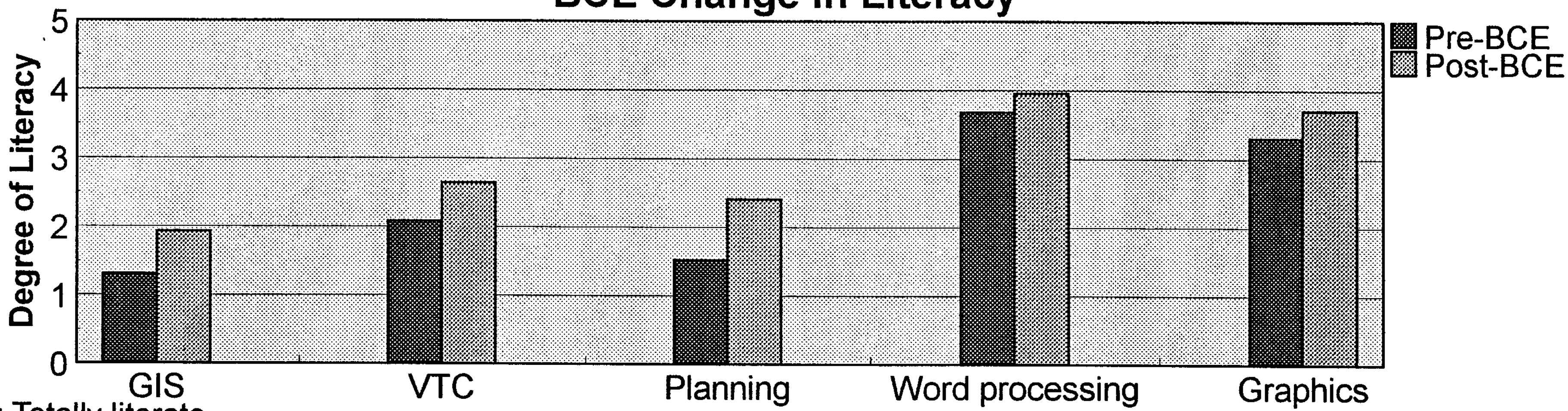
Although there was a general rise in the self-assessment of technological literacy, observations of the class showed that this was not a result of the user friendliness of any technologies used in the MSF. Generally, the systems were cumbersome and difficult to use to some degree, usually because of immaturity. As shown on the chart, a list of factors combined to diminish the user-friendliness of the environment as a whole.

Because Force XXI will be a knowledge-based force, competency in certain fundamental technologies must be high. Since this competency was assessed as low, it must be increased. This must be addressed within the Army, as the external environmental cannot take care of this in a focused manner. Although the next generations are maturing in the information age, they are not taught the theory required to optimize such a high technology battle command environment.

# Technological Literacy

## *Related issue - user friendliness*

BCE Change in Literacy




5 = Totally literate
3 = Competent in subject matter
1 = Totally Illiterate

- Digital mapping systems (Phoenix, ASAS, TEM-OPS) are all GIS
- Competency in planning tools, GIS, VTC must be increased
- BCE experience enhanced literacy in these areas

- User-friendliness lacking
  - Deeply layered, time-consuming menus
  - Archaic E-Mail system
  - Unreliable backup system
  - No print capability
  - Constraining network
  - Potentially helpful features not used due to slow, cumbersome interface

✓ ***GIS illiteracy will not "resolve itself"***
✓ ***Functions must be unburdened to achieve potential***

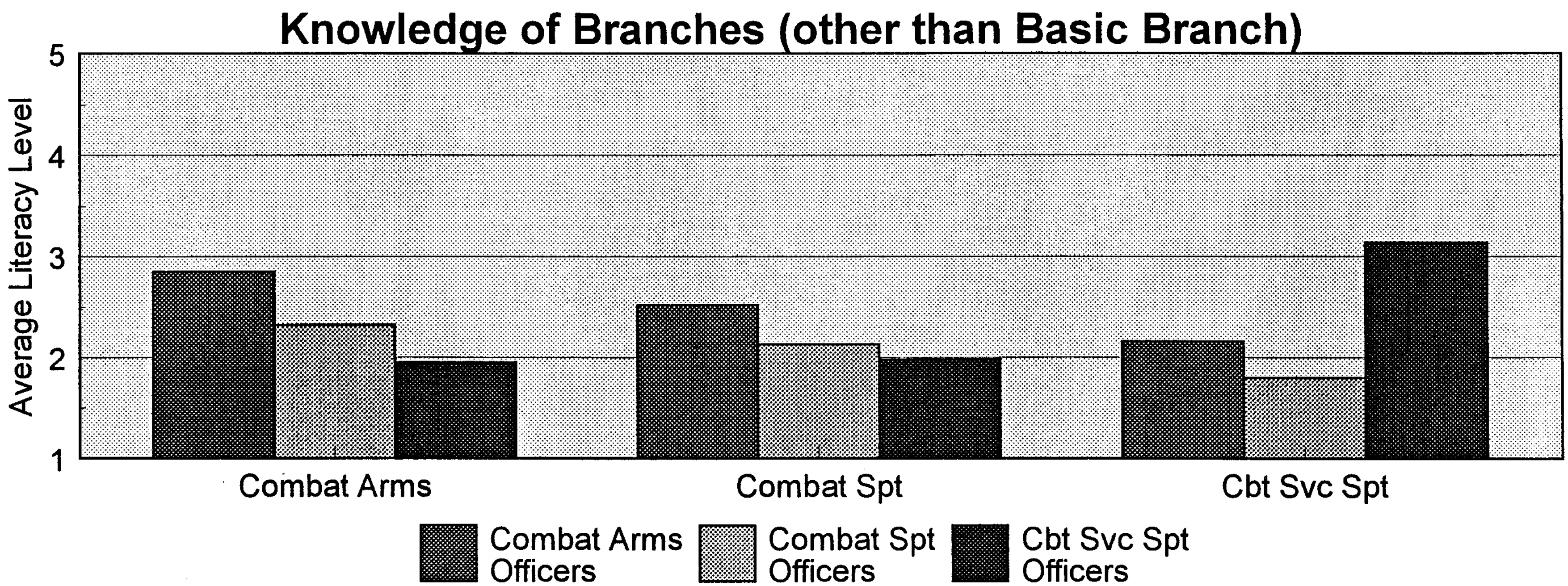
# MULTI-FUNCTIONAL LITERACY

The DBS concept relies on multi-functional staff officers, proficient in several branches or BOSs, to man the staffs. Because the concept was examined in the experiment, multi-functional literacy was assessed similarly to technological literacy. The students assessed themselves to have low cross competency in both branches and BOSs. This was not surprising, as officers at this level have spent most of their career concentrating on developing expertise in one branch and one BOS. There were two significant survey results to note. The first was that competency in the combat service support branches was generally ranked low by non-CSS officers. Second, air defense competency was ranked particularly low by most non-ADA officers. These survey results were confirmed by observations during the experiment.

Because any highly digitized force will probably rely on many multi-functional planning and execution activities, cross competency in branches and BOSs is important. Cross competency, assessed as low, must be increased to support any multi-functional concept. Army leadership must determine the appropriate level of cross competency required, and then determine how best to achieve that level.

# Multi-functional Literacy

## *A Stated Requirement for Digitized Battle Staff*




5 = Totally Literate
3 = Competent in Subject Matter
1 = Totally Illiterate

- DBS multi-functionality requirement may be overstated
- BUT -- asymmetrical force packaging heightens requirement

✓ ***Current level of multi-functional literacy insufficient for DBS or asymmetrical force packaging***

## SOURCES OF COMPETENCY

Students were asked to identify the pillars (institutional, operational, and self-development) which contributed to their leader competencies. The responses identified both the frequency and value of pillars' contribution. As shown on the chart, the student surveys indicated that the operational pillar has been decidedly the most valuable contributor to all competencies except professional ethics.

# Sources of Competency

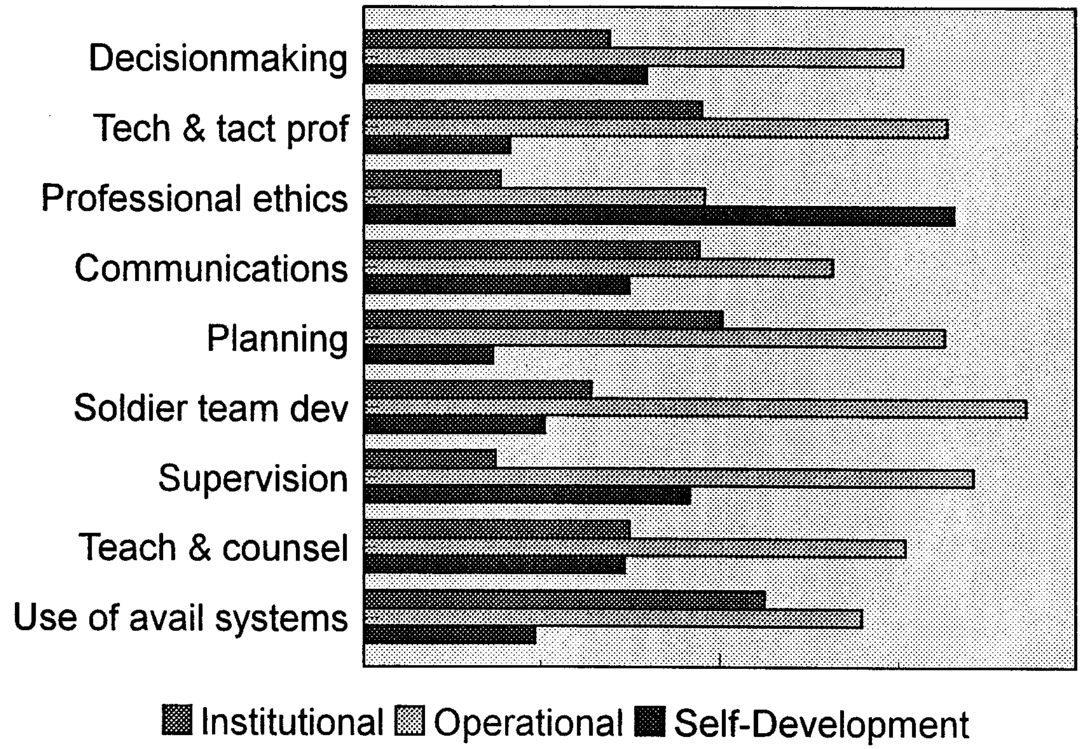
## *Contribution of Pillars to Leader Competencies*

### Leader Competencies

- **Decisionmaking**
- **Technical and tactical proficiency**
- **Professional ethics**
- **Communications**
- **Soldier team development**
- **Planning**
- **Teaching and counseling**
- **Use of available systems**
- **Supervision**

- Post exercise BCE survey -- four most important competencies ALSO four most difficult to acquire

### Value of Pillar Contribution




- **Operational pillar the most valuable contributor to most leader competencies**

***✓ Alignment of top competencies raises the stakes for all pillars***

# SOURCES OF COMPETENCY

Students were asked to identify the pillars which contributed to their technological or multi-functional literacy. These responses also identified both the frequency and value of pillars' contribution. The student surveys indicated that the operational pillar has been the most valuable contributor to literacy in most technologies. This pillar was also assessed as the most valuable contributor to branch and BOS literacy. As an example of the results, the chart shows the value of pillars' contributions to BOS literacy.

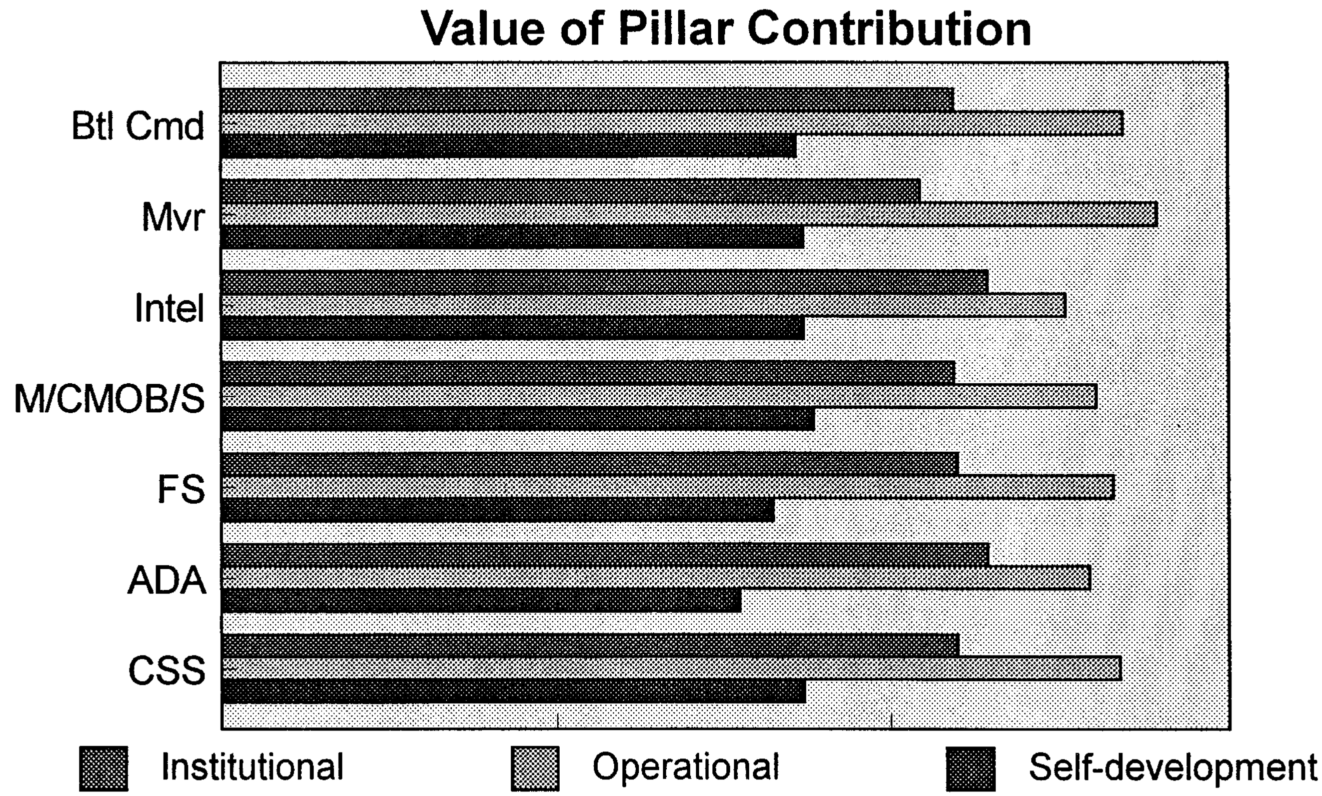
The institutional pillar was assessed as the least frequent and least valuable contributor to literacy in most technologies. However, this pillar was assessed as the most frequent contributor to branch and BOS literacy. This probably reflects the fact that the institutional pillar has had development of branch and BOS literacy as a mission, but not yet the development of literacy in the technologies assessed.

The self-development pillar was assessed as the least frequent and least valuable contributor to branch and BOS literacy. Therefore, there is probably some potential for the self-development pillar to be leveraged to develop requisite multi-functional literacy, whatever this level is determined to be by the Army leadership.

The positive aspects of the analysis, the "what is," have been discussed thus far. Any normative conclusions, those addressing "what should be," have to be made by the appropriate Army leadership. The Army must consciously decide what each pillar is expected to provide, and then revamp the overall educational and training program to do it. Assuming that the Army intends to meet future demands for technological and multi-functional competency by raising the contributions of the leader development pillars, there are two major implications for Force XXI. First, the institutional pillar can and must be strengthened to contribute more often and more valuably to the development of competency in technologies. Second, the self-development pillar can and must be strengthened to contribute more often and more valuably to attaining multi-functional literacy.

# Sources of Competency

## *Contribution of Pillars to BOS Literacy*




- Operational pillar most valuable contributor to BOS literacy
- Similar results in technology literacy, except self development contributes in commonly used software packages
- **Operational pillar setting the standard**

***✓ Need to review and confirm (validate) expected contributions of all pillars***

## SUMMARY

Conclusions, recommendations, and products will be discussed in this portion of the briefing report.

# Summary

***Conclusions, Recommendations and Products***

# CONCLUSIONS

Many of the information technology capabilities requisite for Force XXI are available now in one form or another, and range from prototype to objective systems. The current and future challenge will be to optimally integrate these systems. One component of an optimally integrated Force XXI battle command system will be efficient, effective, and user-friendly interfaces.

A key component of a responsive battle command decision support system is the suite of tools to support COA analysis and battlefield prediction. These tools are currently being developed. These will be especially important in extended battlespace. Given that the future force will be required to fight in extended battlespaces, responsive, simple and understandable graphic control measures will be required to best support the command and staff.

The DBS concept was not fully explored during the experimentation. The specific prescription offered by the concept may not be the answer, but variants of the DBS concept offer a useful vehicle to explore effective ways to flatten headquarters to take advantage of advanced information technologies. The DBS concept was a significant attempt to re-engineer the division headquarters. The DBS concept reiterated the need in the future for command and staff who are competent in multiple branches and BOSs. Multi-functional literacy must be increased to support any such concept, since such literacy was shown to be low. However, the need for specialists will not be eliminated in the future force, complicating further personal professional development requirements.

The full implementation of information operations and other Force XXI doctrine will cause both expected and unexpected impacts. It was not expected that there would be an assessed difficulty of acquiring competency in professional ethics. The lack of GIS literacy which was revealed is a significant concern because of the fundamental nature of the technology. IO may require a change in the expectations that the Army's leadership makes of the leader development pillars.

Survey results showed that information availability will complicate decisionmaking. The information age will bring about a proliferation of information on the battlefield that the commander will have to reconcile to make timely tactical decisions.

# Conclusions

- Many of information technology capabilities are available; challenge is integration and user interfaces
- COA analysis and predictive tools are lacking
- New control measures may be required for expanded battlespace
- Digitized battle staff concept not fully explored
- Multi-functional literacy must be increased, but the need for specialists will not be eliminated
- Information availability will complicate decisionmaking
- IO will cause unexpected impacts (e.g., difficulty of acquiring competency in professional ethics)
- Lack of GIS literacy is a significant concern
- IO may require a change in expectations of leader development pillars

# RECOMMENDATIONS

There were several ideas explored in the experiment that are recommended for investment or implementation. ABCS systems, integrated and interoperable, were shown to be supportive of Force XXI battle command requirements. Large displays were shown to especially enhance command and staff collaboration, regardless of the level of digitization achieved in the headquarters. Both technological literacy and multi-functional literacy were assessed as generally lacking. These literacies must be well developed to ensure the success of the future force. Along this line, a review by the appropriate Army leadership of the Army's expectations of the leader development pillars needs to be made to optimize them relative to their role in Force XXI.

There are several ideas recommended for further experimentation. The most significant of them is the digitized battle staff. As stated earlier, DBS and variants of it provide a vehicle for experimentation in re-engineering of tactical headquarters. Further experimentation into several battle command decision support capabilities and characteristics is also warranted. These include battlespace control measures; COA analysis tools; planning, prediction, and rehearsal tools; and user-friendly interfaces.

Redundancy of systems and means was shown to be required for successful battle command. Printed matter was also observed to be useful to the command and staff, for personal and collaborative use. Further, there was evidenced usefulness of command and staff collaboration around large sized paper maps, in lieu of electronic large screen displays. Finally, optimization of electronics in tactical headquarters does not imply absence of paper. Thus, the idea of the paperless TOC should be discarded from further consideration.

# Recommendations

## *Force XXI Implications*

### Invest/Implement

- ABCS systems
- Large displays
- Technological literacy
- Multi-functional literacy
- Review of expectations in leader development pillars

### Experiment

- Digitized battle staff
- Battlespace control measures
- COA analysis tools
- Planning, prediction, and rehearsal tools
- User-friendly interfaces

### Discard

- Paperless TOC

## MSF/BC 95 ANALYSIS PRODUCTS

This scripted briefing, which summarized the salient findings and characteristics of the experimentation, is the capstone document of the *MSF/BC 95 Experiment Final Briefing Report.* A series of supporting technical monographs completes the analytic documentation. These technical monographs detail the experimental context, and the full analysis and findings of the effort. As shown on the chart, there was also a report published by OPTEC on the entire PW/MSF 95 AWE, in which Appendix A of that report specifically detailed battle command findings.

The technical monographs include an overview of the MSF Commander's efforts in the experiment. These efforts were directed at furthering the three concepts; Mobile Strike Force, Digitized Battle Staff, and Information Operations. Thus the monograph, *An Analyst's Observations - The MSF Commander: Knowledge-based Force Command Requirements*, provides a valuable insight into the 95 experiment.

Additionally, there is the set of DTLOMS-based monographs. This set includes those shown on the chart focused on the pillars as indicated, although there is certainly some overlap of the monographs beyond single or dual pillars. These monographs provide full analytic results, whereas the scripted briefing presented salient example findings. As an example, the leader competencies monograph describes the surveys completely and presents results on all nine competencies.

Any of the monographs or the OPTEC report can be obtained from TRAC by contacting Mrs. Peggy Fratzel, DSN 552-9168.

# MSF/BC 95 Analysis Products

## *Insights for BCBL(L) and Beyond*

- MSF/BC 95 Experiment Final Briefing Report
- OPTEC PW/MSF 95 AWE Assessment (Appendix A, Battle Command Issues)
- An Analyst's Observations -- The MSF Commander:
  Knowledge-based Force Command Requirements
- DTLOMS-based monographs: